BIODIVERSITY OF AEROMYCOFLORA IN TRADITIONAL AND MODERN SHOPPING MALL OF RAIPUR CITY (C. G.)

INTRODUCTION

Aerobiology is a scientific discipline focussed on the transport of micro-organism and biologically significant materials. It is concerned with the sources of organisms or materials, their release in atmosphere, dispersion, deposition and impact on human and animal system. These airborne biological particles totally depend on available vegetation of that particular area. Medium to heavy rain fall, hot and humid meteorological conditions and rich forest vegetation are very much favourable for growing fungal spores.

Fungal spores population vary from place to place due to environmental conditions and vegetation. Different study and reports show that fungal spores are main cause for seasonal and other type of allergic reactions. Aerobiological studies can be classified as outdoor or extramural aerobiology concerned with the survey of airborne microbial population in open atmosphere and indoor or intramural aerobiology concerned with survey of airborne microbial population inside the building or in a closed atmosphere.

Brief review of the work already done in the field

Interest in the microbiology of atmosphere dates back as far as to year 1800 when the potential sources of airspora were discovered and identified. Recent studies in aerobiology, however, had its origin about a one and half century ago, when Louis Pasteur (1861) proved in his classical experiment in combating theory of spontaneous generation of life and developing germ theory of disease that air is carrier of many common germs. In India Cunningham's (1873), analysis of micro organic content air over Presidency jail Calcutta. Other contributions which are followed by Miquel (1883) who elaborated techniques to analyse the microbial population of air. However the

credit for establishing subject of microbiology of atmosphere as a special branch of study goes to Meier et al (1933) of United States, Stepanov (1935) of U.S.S.R. Aerobiology word was coined by Meier (1935). He was the first who attract the Botanist, meteorologist, zoologists, bacteriologist and plant pathologists, medical experts and also other specialist in this field. He was the founder member of "Committee on Aerobiology" the committee met for first time on 12th Nov. 1937 in Washington.Gregory(1961) work on atmospheric microbiology he is also known as father of modern microbiology.

Aerobiology has emerged as an important applied subject in India during last 50 years. Systematic and extensive studies of aerobiology in India can be said to have started with the work initiated by Prof. Sreeramulu and Ramlingam (1966,67) two years study of airspora of paddy field near Viskhapatnam and also worked on two year study on paddy field near Madras. Sreeramulu (1974) contineous worked on crop fields and its application. After that aerobiology work extensively done by Dr. Tilak and Kulkarni (1970) new air samplers used at Aurangabadand. Aerobiological studies in India and putting India in word aeromycological map goes to Dr. Tilak. Dr. Tilak (1982, 84,87,89,&98) also continued his works on airospora& published books on Aerobiology. Apart from these centres more centres come into existence like Allahabad, Nagpur, Gorakhpur, Gwalior, Jabalpur, Manipur, Bodhgaya and Raipur. Pandey (1974) study on airspora of field of Nanded. Singh & Babu (1983) work on airborne fungal flora of Delhi. Agashe & Sudha (1995) studies on cercadian periodicity of fungal spores in Banglore city. An analysis of Aeromycoflora at vegetable market of Lucknow was by Khandelwal and Mishra (2005). Aeromycoflora of a vegetable and fruit market in relation to occurence of market diseases by Khilare and Varpe (2005). Aeromycological study of fish, meat and vegetable market by Begum and Ahmed (2006).

Aeromycological study at fruit market Baroda and certain diseases of fruits by Chitra and Arun (2007).

work has been done by fungal spores in different working places Sharma and Dutta (2010). Exposure to indoor fungi in different working environment a comparative study Dutta & Singh (2010). Monitoring and assesment of airborne fungi in Kolkata (India) by viable and non viable air sampaling method also used for the study of aeromycoflora. Indoor and outdoor air quality with special reference to four working places in Kerala Nayar and Jothis (2012).

OBJECTIVES

The study of fungal spores is of high significance due to its role in the field of human allergy, plant diseases (Ellis1985). Molds and fungal spores found in the shopping centres cause a variety of health problems including asthma, respiratory tract infections, allergic reactions, headache, nasal congestion, eye and skin irritations, coughing, sneezing, fatigue, dizziness etc..

Extramural environment of shopping centres may be the source of the spores where fresh air introduced but in intramural locations of shopping centres serve as suitable sites for the growth of fungi such as dry fruits, cereals, pulses, bakery products, furnitures, carpets, clothes, leather products, etc. .

There has been lack of systemic, volumetric, seasonal and ecological study of the composition of the environment of modern and traditional shopping centres. Thus one year assessment will be carried out in the traditional and modern shopping centres of the city which purposes to prepare fungal spore calendar and to statically co-relate the data with meteorological parameters and seasonal variations of some fungi.

The objectives of the study are-

- To determine microbial population in traditional shop and modern shopping mall.
- To identified isolated micro-organisms.
- To study the effect of meteorological parameters (temperature, humidity etc.)
- Comparative study on the occurrence of airborne viable fungal spores present in environment of traditional shop and modern shopping mall.
- Ecological studies of aeromycoflora of traditional shop and modern shopping mall.

Note worthy contribution in the field of proposed work

Aerobiological research work started and developed by Tiwari and his co –workers (1994 till date) in chattisgarh. Tiwari & Godheja (1985) reported comparative study of airospora and phylloplane mycoflora of brinjal at Raipur. Tiwari and Sahu (1986,87,89,90&91) worked on different genera of crops and their leaf surface mycoflora of *Raphanus sativus L. Brassica compestris L., Datura alba L., Cicer arietinum L., Phaseolus mungo L. Pisum sativum L. & Abelmoschus esculentu*m variety of pusa cranti. Pandey, Sahu & Tiwari (1989) work on leaf surface mycoflora of *Cucumis sativus L*. Khira. Pandey and Tiwari (1991) work on Aeromycoflora of Raipur.Sahu (1992) studied on leaf surface mycoflora of *Lycopersicum esculentum Mill.* Pandey and Tiwari (1994) worked on airomycoflora in Library. Jadhav and Tiwari (1994) studied on aeromycoflora of Raven village. Jadhav (1996) studied the aeromycoflora over the rice field at Balodabazar. Tiwari (1999) reported aerbiological studies of Raipur with special reference to fungal spora. Studies of Aeromycoflora in relation to leaf surface, mycoflora of *Ocimum sanctum L.* By Sharma (2001). Tiwari, Jadhav & Saluja (2004a, 2004b) studied

aeromycoflora of different heights and aeromycoflora of Library . Studies of Aeromycoflora in relation to leaf surface mycoflora of *Catharanthus roseus L* by Saluja (2005). Tiwari and Tiwari (2005) studied on Pachpedi Naka aeromycoflora Of Raipur. Tiwari, Jadhav, and Kunjam (2005a&2005b) studied on aeromycoflora of Dairy area and slum area. Studies of Aeromycoflora in relation to leaf surface mycoflora of *Mentha arvensis L* by Singh (2006). Aeromycoflora of tribal atmosphere at Panbaras region Rajnandgaon (C.G.) Kunjam (2007). Lall (2008) worked on Indoor & outdoor environment of ambedker hospital Raipur. Seasonal variations of aeromycoflora in *Catharanthus roseus L.* Tiwari and Saluja (2009). Deo (2009) worked on mycofloral study of enviornment of pond. Leaf surface mycoflora of *Catharanthus roseus* L. in relation to enviornmental factor by Tiwari and Saluja (2010) Biodiversity of aeromycoflora of garden Collectrate Parisar at Raipur by Tiwari, Jadhav & Lall (2011). Ecological studies of aeromycoflora of *Catharantus roseus* L. by Tiwari and Saluja (2012).

PROPOSED METHODOLOGY

The modern shopping centres are artificially ventilated closed system whereas traditional shopping centres are open system with fully ventilated areas. So the study of viable fungal spores in modern shopping centre environment is most appropriate to study the variations in environmental conditions as they are not affected by extramural climatic disturbances and therefore remain constant. For the study of aeromycoflora 3 Petri plates containing PDA (Potato dextrose agar) media will be exposed horizontally (1 meter above) on the 3 experimental locations of Traditional shops and modern shopping mall for 5 minutes, twice in a month.

The Petri plates will be incubated (25 ± 1ºc) for 6-8 days. The fungal colonies will be counted, isolated and identified with the help of

available literature and books after incubation period. Pure cultures of the isolates are maintained in PDA medium. At the end of incubation period, the percentage of frequency and abundance of environment of traditional shop and modern shopping centres will be assessed (Prasad and Bilgrami 1969, Tiwari 1977 Saluja 2005 and Lall 2008).

$$\% \text{ of frequency} = \frac{\text{No. of plates in which a species appeared}}{\text{Total no. of plates}} \times 100$$

$$\% \text{ of abundance} = \frac{\text{Total no.of colonies of a species in all the plates}}{\text{Total number of colonies}} \times 100$$

METEROLOGICAL DATA

Meterological data (Temperature, Relative humidity and rainfall) will be recorded from Indira Gandhi Krishi Vishwavidyalaya, Raipur during investigation period.

PLAN OF WORK

- Survey of aeromycoflora of traditional shop and modern shopping centres.
- Seasonal variations of aeromycoflora of traditional shop and modern shopping mall.
- Mycobial ecology of aeromycoflora of traditional shop and modern shopping mall.

EXPECTED OUTCOME OF THE PROPOSED WORK

Aerobiologists are mainly interested in the entrapment, identification and enumeration of transported biological materials in the atmosphere since it serves as an important medium of dispersal of microbes in shopping centres. Assessment of shopping centres aeromycoflora is necessary for the control and prevention of fungal diseases so as to protect the human from fungal allergy

and to minimize heavy economic losses through spoilage of grains by fungal spores present inside the shopping centres.

Hence such study in Raipur city will be helpful for the proper treatment of allergic patients. Fungal spore data in different season should be included in air quality. Information reports on fungal spore prevalence and abundance may be helpful in environmental management of patients suffering from fungal allergy.

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BIBILIOGRAPHY

- **Agashe, S. N. and Sudha,** P 1995 Studies on circadian periodicity of Fungal spores in Banglore city. *Ind. J. Aerobiol*. **8 (1 & 2) : p.17-23**.
- **Arya Chitra and Arya Arun** 2007Aeromycoflora of fruit markets of Baroda, India and associated diseases of certain fruits. *Aerobiologia:* Dec. 2007 vol.23 issue 4 **p.283-289.**
- **Begum J. and Ahmed K.** 2006 Aermycological study of fish, meat, and vegetable Market. *Natures environment. Pollution Technol*.: 5(2) **pp**.**305-307**.
- **C. J. Khilare and Varpe D.D.** 2005 Aeromycoflora of a vegetable & fruit market in relation occurrence of market diseases. Cab direct, (book) *changing trends in pollen spore research*: 2005 pp. **95-107**,ISBN 81-7019-435-0, Record no. 20073059199.
- **Cunningham, D. D.** 1873 Microscopic examination of air. Govt. Printer. Calcutta**. Pp. 58.**
- **Deo Sajal Saju** 2009 Diversity of Biotechnological study of fungi in enviornment of pond.Ph.D.Thesis, Pt.RSU,Raipur.
- **Dutta A.K. and Singh A. B.** 2010 Exposure to indoor fungi in different working Environment a comparative study. A*erobiologia* :Vol.26, 2010, num 4, **pages 3-7**.
- **Ellis** 1985 Micro fungi on land plants. Croom Heim, London, Sudney.
- **Gregory, P. H.** 1961 The microbiology of the atmosphere. Leonard, Hill (Books) *Ltd. Interscience Publishers*. INC *New York* : **p. 233.**
- **Jadhav, S. K** 1996 Studies of Aeromycoflora over rice Field at Balodabazar, Raipur (M.P.). Ph. D., Thesis Ravishankar University, Raipur (M.P.).
- **Jadhav, S. K. and Tiwari, K. L.** 1994 Aeromycoflora of Ravan village. *Indian Bot. Reptr*. **1 (1&2) : p.33-36**.
- **Sahu, S. K.** 1992 Studies on the leaf surface mycoflora of *Lycopersicum esculentum* Mill. In relation to age and environmental factors. *Biome*. **5 : p.95-100**.
- **Khandelwal Asha and Mishra Lily** 2005 An analysis of Aeromycoflora at a vegetable market of Lucknow. Cab direct, (book) *changing trends in pollen spore research*: 2005-**pp.-1 to 10**. ISBN 81 -7019-4350. Record no 20073050182.
- **Kunjam S** 2007 Studies of Aeromyflora of trible Atmosphere at Panabaras region Rajnandgaon district (C. G.). PhD Thesis.
- **Lall B.M.** 2008 Studies of indoor and Outdoor Aeromycoflora of Dr.Bhim Rao Ambedker Hospital Raipur.
- **Meier, F. C. Stevneson J. A. And Charles, V. K.** 1933 Spores in upper air. Phytopathology, **23: p.23.**

- **Miquel, P.** 1883 Less organism Vivantes del Atmosphere Gouier Villas. Paris **p.310**
- **Nayar T.S. & Jothis P.S.** 2012 An assessment of the air quality indoor and outdoor air with reference to fungal spores and pollen grains in four working environment in Kerala India. Aerobiologia online 30th July 2012.
- **Pasteur, Louis** 1861 Memoire Sur Les Carpuscles, Organises qui existent dans L atmosphere. Examende la doctrine des generations spontonees. Ann.Nat. (Zool) 49 ser. **16 :p.5-98**.
- **Prasad, S. S. And Bilgrami, R. S**. 1969 Investigations on *lichi* I. Phyllosphere mycoflora in Relation to fruit. Rot. *Indian phytopath,* 32:**509-510.**
- **Pande, B. N.** 1976 Studies in airspora over some fields at Nanded. Ph.D.Thesis,Dr. B..A. Marathwada University, Aurangabad. (M. S.).
- **Pandey, P., Sahu, S. K and Tiwari, K. L.**1989 Variation in the number of leaf Surface And air mycoflora of Khira (*Cucumis sativus,L*.) (Abst.) 76th ISCA p. 56
- **Pandey, P. and Tiwari, K. L**.1991 Aeromycoflora of Raipur. (Abst.) *6th Nat. Con. Aerobiol. Pandichery* **p. 113**
- **Pandey, P. and Tiwari, K. L.** 1994 Studies of Aeromycoflora in library. *5th International conference on Aerobiology*. Banglore (Abst).
- **Sahu, S. K.** 1992 Studies on the leaf surface mycoflora of *Lycopersicum esculentum* Mill. In relation to age and environmental factors. *Biome*. **5 : p.95-100**.
- **Saluja P.K**. 2005 Studies of aeromycoflora in relation to leaf surface Mycoflora of *Catharanthus roseus L.* Ph.D thesis at Pt. R.S.U. Raipur. (C.G.)
- **Sharma, D. And Dutta, B. K. and Singh A. B.** 2010 Exposure to indoor fungi in different working environment a comparative study. *Airobiologia* :Vol. 26, 2010
- **Sharma, Kavita** 2001Studies of aero mycoflora inrelation to leaf surface mycoflora of *Ocimum sanctum* L. Ph. D., Thesis Pt. Ravishankar University, Raipur (C.G.).
- **Singh N.B.** 2006 Studies of aeromycoflora in relation to leaf surface mycoflora of *Mentha arvensis* L..Ph.D thesis at Pt. RSU at Raipur (C.G.).
- **Singh, A. B. and Babu, C. R.** 1983 Airborne fungal flora of Delhi, India. *J. Chest. Dist. Alled. Sci*. **25 : p.31-35**.
- **Sreeramulu,** T. 1974 Airspora of crop field and its applications. *Jr. paly*. **6 : p.31-38**.
- **Sreeramulu,T. and Ramlingam, A** 1967 A two year study of the air spora of paddy fields near Madras .PANS **13 :p.135.**
- **Sreeramulu, P. and Ramlingam A.** 1966 A two years study of airspora of paddy field near Visakhapatnam. India. *J. Agril. Sci.* 36: **p 112-132**

- **Stepanov, K. M.**1935 Dissemination of infective diseases of plants by air currents. *Phytopath*. **8 : p.1-68**.
- **Tilak, S. T.** 1982 Aerobiology. Vaijyanti Prakashan Aurangabad, **p.-211**
- **Tilak, S. T.** 1984Aerobiology and cereal crop diseases; *Rev. Trap. Plt. Path.I* (S. P. Raychaudhary ed.).
- **Tilak, S. T**. 1987 Air Monitoring. Vaijyanti Prakashan, Aurangabad. **p.110.**
- **Tilak, S. T.** 1989 Atlas of airborne.
- **Tilak, S. T.** 1998 Aerobiology (Biology of Air borne organisms) Satyajeet Prakashan, Pune**. P.504**
- **Tilak, S.P. and Kulkarni, R.L.**1970 A new air sampler experiencia, 26**.p**.**443.**
- **Tiwari, K.L** 1977 Studies on the leaf surface Mycoflora of some solanaceous Crop plants. Ph. D. Thesis Jabalpur university.
- **Tiwari K.L, Jadhav S.K and Lall B.M**. 2011Biodiversity of Aeromycoflora of garden Collectorate parisar, Raipur. International journalof *enviornmental sciences*: vol.1,no.1,2011.
- **Tiwari, K. L. and Godheja, A.** 1985 Airspora and the phylloplane of Brinjal At Raipur. Bot. Res. Chhatt. 1 : p.149-152.
- **Tiwari, K. L., Jadhav, S. K. and Singh, N. B.** 2005 Aeromycoflora over mint Plant (*Mentha arvensis L.*). 13th Nat. Conf. A Aerobiol., Inst. Of Sci. Nagpur, E 1- p. 53.
- **Tiwari, P**. 1999 Aerobiological studies of Raipur with special reference to fungal spores Ph.D.,Thesis Pt. R. S. Shukla University, Raipur (M.P.).
- **Tiwari K.L. & Saluja P.K** 2009 Seasonal variations of aeromycoflora in *Catharanthus roseus* L.,A quarterly journal of *life sciences* 2009 vol. 6(i) issue **page 82 to 85** ISSN0973-1431.
- **Tiwari K.L . & Saluja P.K.** 2010 Survey of leaf surface mycoflora of *Catharanthus roseus* L. in relation to environmental factor. *Flora & fauna*, 2010 vol.2 **pp 233-238.**
- **Tiwari K.L . & Saluja P.K.** 2012 Ecological studies of aeromycoflora of *Catharanthus roseus* L. Ind.J.*Applied & pure bio*.vol.27(1)**55-64.**
- **Tiwari, K. L. and Sahu, S. K.** 1986 Studies on the leaf surface mycoflora of *Raphanus sativum* L. Plant. (Abst.) *5th Ann. Sess. M. P. Vigyan Acad.* **p.2.**
- **Tiwari, K. L. and Sahu, S. K**. 1987 Effect of temperature and relative humidity on the leaf surface mycoflora of mustard.
- **Tiwari, K. L. and Sahu, S. K.** 1989 (a) Aerobiology of *Datura alba* L. In relation to leaf surface microflora. *Biosphere* : **13 (2) : p.20-27**
- **Tiwari, K. L. and Sahu, S. K.**.1989 (b) Aerophyllomycoflora of *Cicer arietinum L. Ad. Plant Sci.* **2 (1): p.39-47**.
- **Tiwari, K. L. and Sahu, S. K.** 1990 Studies on the leaf surface *mycoflora* of

Phaseolus mungo L. and *P. radiatus* L. in relation to environments. (Abst.) *77th ISCA. Cochin.*

- **Tiwari, K. L. and Sahu, S. K.** 1991Studies on leaf surface mycoflora of *Pisum sativum* L. in relation to the age and environental factors. *Ad. Plant. Sci*. **4 (1): p.143-149**.
- **Tiwari, K. L., Jadhav, S. K. and Kunjam, S.** 2005 (a) Studies of Aeromycoflora of Dairy area, *(Abst.) 13th Nat. Conf. Aerobiol*. **D-4, p.-4**.
- **Tiwari, K. L., Jadhav, S. K. and Kunjam, S.** 2005 (b) Aeromycoflora of Slum area. *(Abst.) 13th nat. Conf. Aerobiol, Inst. of Sci. Nagpur,* **D 5, p.-4**.
- **Tiwari, K. L. Pandey, P. And Sahu, K.** 1993 Aeromycoflora *Abelmoschus esculentum* Variety Pusa Kranti, (Abst.) *7th Nat. Conf. Aerobiol*. Gwalior. Abst, **p 29.**

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